



***Darwin Initiative for the Survival of Species
Final Report***

***Tree Diversity, Agroforestry Development
and Reafforestation in the Peruvian Andes***

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Final Report

1. Darwin Project Information

Project Reference No.	332
Project title	Tree diversity, agroforestry development and reforestation in the Peruvian Andes
Country	Peru
UK Contractor	Royal Botanic Garden Edinburgh (UK)
Partner Organisation (s)	Herbario MOL, Departamento de Ciencias Forestales, Universidad Nacional Agraria, La Molina (Peru) Asociación Peruana para la Promoción del Desarrollo Sostenible (APRODES) (Peru) Royal Botanic Gardens, Kew (UK)
Darwin Grant Value	£77,724
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Project website	www.darwintreediversity.org.pe
Author(s), date	Toby Pennington/Carlos Reynel

2. Project Background/Rationale

Peru is a resource poor country containing c. 10% of the world's plant species. Its Andean forest ecosystems are species rich, but heavily deforested because the majority of the rural Peruvian population lives in mountainous areas, cultivating key crops such as coffee and coca. Most botanical research in Peru has focused on lowland Amazonian forests, with many Andean forest areas entirely neglected. *Tree diversity, agroforestry development and reforestation in the Peruvian Andes* addressed a need for basic information about montane tree species and the ecosystems that they inhabit. It focused upon species that have economic uses and which are suitable for reforestation, and aimed to support the work of organisations active in agroforestry programmes in the Peruvian Andes. The project therefore aims ultimately to reconcile the elimination of poverty by improving livelihoods of resource-poor Andean populations with the implementation of Peru's commitments to the CBD.

If Peru is to meet its obligations to the CBD, the ability to balance economic development with biodiversity conservation is paramount. The capacity to identify tree species that form the framework of its forest ecosystems is fundamental to this aim. Unlike most other Latin American countries, Peru is not covered by a major international flora-writing project, and its own resources to identify biodiversity are poor. This project aimed to address these issues in two ways: by the training of Peruvians in tree identification, biodiversity assessment and biodiversity collections management, and through the repatriation of data concerning economically useful tree species. Given the immense scale of Andean plant diversity, we proposed a restricted and achievable target, focusing upon economically important Andean

tree species that can contribute to small-scale agroforestry systems, and which are useful in reforestation. In dialogue with one principal project partner, APRODES, and with other organisations active in agroforestry and reforestation in the Andes, we developed a list of 130 species that are useful for these purposes. Some of these priority tree species were not scientifically identified, and were known only by their Spanish vernacular names. This project discovered their scientific names and uncovered existing data relating to their uses and about related species of economic use. This is summarized in the project's principal output, a user-friendly guide for the identification and silviculture of these species. The aim of this guide is to increase the breadth of species used in agroforestry and reforestation in Andean Peru.

Identification of the project

This post-project followed and built upon "Tree diversity and agroforestry development in the Peruvian Amazon" (09/017). The prior project provided a user-friendly identification and silviculture manual to 140 economically useful tree species from the Peruvian Amazon. The identification manual was highly demanded, which indicated a need for similar manuals covering useful trees from other ecosystems. This need was confirmed by a request from APRODES for a field guide to identification and silviculture of Andean tree species to aid their agroforestry and re-forestation work in the Central Peruvian Andes. The demand for such information was corroborated during the current project by requests for the inclusion of additional species in the identification guide from other organisations (e.g., Pronaturaleza) working in the Andes.

The prior project also aimed to build capacity within Peru for the identification of tree species that is essential for biodiversity assessment. A principal focus for this capacity building was the Peruvian National Forest Herbarium (MOL). The prior project intended only to mount, incorporate and database collections relating to a restricted set of Amazonian tree species useful in agroforestry, but with the hard work and commitment of project-trained MOL staff, greater progress was made. However, 15000 specimens remained to be mounted and incorporated into the collection, and the completion of this work became a major goal of this post-project funded work. Considering the heavy use of this collection for identification of trees collected throughout Peru, and especially its educational value to undergraduate students at MOL this is a valuable long-term investment and legacy.

The prior project provided much needed herbarium equipment and infrastructure at MOL, but herbaria were entirely lacking at the Universidad Agraria's Andean field stations in the Chanchamayo valley and at Satipo. Because of their relative proximity to Lima, these are the University's main sites for training in the identification of forest trees. However, both lack herbaria, which clearly hampers student training. The post-project has provided two small teaching herbaria facilities at both these field stations.

3. Project Summary

Purpose

To build capacity in Peru to survey, conserve and sustainably use Andean forests and their tree species, with particular emphasis in the Central Andean Chanchamayo region.

Objectives

1. To complete building the capacity of the Peruvian National Forest Herbarium (MOL) to enable it to deliver accurate tree species identifications essential for biodiversity assessment that underpins the conservation of Peruvian forests. This builds upon the original project by completing the process of mounting, incorporation and distribution of specimens in the MOL collection, and by provision of a database available via the www of specimens only held at MOL and with no duplicates elsewhere.
2. To provide information on identification, uses, and silviculture of 100 Andean tree species with economic potential, and of species suitable for reforestation projects in Andean Peru. This is complementary to the information about economically useful species from the Amazon region provided by the prior project.

Outputs (as outlined in project proposal)

Output 1: mount and incorporate into the collection the backlog of fully identified specimens at MOL, including databasing specimens only held at MOL; distribute duplicates from MOL to other international herbaria.

Output 2: provision of a teaching herbarium in Chanchamayo, Andean Peru.

Output 3: provision of a user-friendly identification manual containing silvicultural information of tree species with economic potential, and of species suitable for reforestation projects in Andean Peru.

Output 4: Publicity to raise the profile of Andean forest conservation nationally and internationally.

The original objectives and operational plan were not modified during the project period. Major changes involved additional outputs and activities, one of which was made possible by receipt of extra funding from the Universidad Nacional Agraria. These extra outputs and activities were:

1. Construction of an additional teaching herbarium in the Chanchamayo region at the Universidad Nacional Agraria's field station in Satipo (approved by Darwin Secretariat, March 2005). This was made possible by leverage of additional funding from the Universidad Nacional Agraria, La Molina, which provided free labour for construction work at La Genova, thereby releasing funding for the project in Satipo.
2. Toby Pennington was granted sabbatical leave from the Royal Botanic Garden Edinburgh (RBGE), enabling him to be in Peru from six months from November 2005 to May 2006. This enabled him to have far more direct involvement with project work, and has resulted in greater fieldwork, teaching and training outputs.
3. From January 2006 we diverted some of the salary money earmarked to employ student trainees in herbarium curation work to José-Luis Marcelo, who gained a permanent position as an assistant professor with MOL. We considered this a sensible change in terms of project legacy because José-Luis' long-term job includes undergraduate student teaching in plant identification, herbarium curation and general botany. The experience he gained via project work will be extremely valuable in improving his student courses. He also joined the project team on field visits to develop his identification skills. Though the university salaries in Peru are very low, and retention

in these junior posts is problematic, José-Luis is clearly very committed to biodiversity science and especially teaching, and we consider that he can make a significant impact in Peru.

The Darwin Secretariat was informed of changes two and three by e-mail, though no response was received.

Articles under the Convention on Biological Diversity (CBD) that best describe the project

Identification and monitoring of valuable native forest tree species (Article 7; see also annex 1 emphasising cultivated/domesticated species and relatives)

Rehabilitation and restoration of degraded Andean forest ecosystems (Article 7)

Improvement to the capacity of MOL and Peru to carry out future forest biodiversity surveys (Article 7/8/9)

In situ conservation of tree species in small-scale agroforestry systems that provide economic benefits (Articles 8/10)

Training of local people through technical and scientific collaboration (Article 12/18)

Repatriation of data from the UK (Article 17)

Sustainably using Andean forest genetic resources of trees that are of actual or potential value for food or agriculture (Programmes of Agricultural Biodiversity, Forest Biodiversity and Sustainable Use of Biodiversity)

Promotion of education on Andean Forest Biodiversity through training MOL and APRODES staff and students (Programme of Public Education and Awareness)

Building capacity of staff and students at MOL and APRODES in taxonomy, systematics and curation, thereby reducing the taxonomic impediment in Peru (Global Taxonomy Initiative)

To contribute to decreasing the loss of plant diversity in Andean forests in Peru (Global Strategy for Plant Conservation)

4. Scientific, Training, and Technical Assessment

Research

Field research in the Peruvian Andes

Field research in the Peruvian Andes was led by Terry Pennington, Carlos Reynel and Toby Pennington, and totalled 20 weeks. It was carried out with logistical support of APRODES in the Chanchamayo region. The principal objectives were to collect specimens from our list of 130 priority tree species using standard botanical collection techniques, and to train Peruvian participants in these techniques and in plant identification skills. We were able to collect high quality fertile specimens of 80% of these species.

Our methodology centred upon finding trees and geo-referencing their location using the

GPS purchased by the project. This enabled trees to be visited repeatedly through the project to ensure collections of flowers and fruit, allowing accurate scientific identification, and made available high quality specimens suitable for illustration for the field guide. These repeat visits also enabled us to gather phenological data on flowering and fruiting times. These data were not known for many of the species on our priority list, and are essential for planning seed and seedling collection programmes. Fruiting of tropical tree species is followed by a short period of seed release and germination. Local people need accurate information on the timing of fruiting, and the ability to identify seeds and seedlings, if they are to be able to collect them before they are destroyed by predators.

Additional fieldwork to that originally proposed (total 65 days) was carried out by Toby Pennington, particularly during his six month sabbatical period in Peru (November 2005 to May 2006). In part, this work was related to other projects and financed by the RBGE and personal funds, but it enabled us to visit various locations in the Andes throughout Peru accompanied by the MOL technician (Aniceto Daza) and the project trainee José-Luis Marcelo (assistant professor at MOL). We were therefore able to expand field training, and collect further material and photographs of the priority species no cost to the project.

Publication outputs

a) Árboles útiles del Ande peruano (authors: Carlos Reynel, Terry Pennington, Toby Pennington, José-Luis Marcelo, Aniceto Daza)

The principal technical output of the project is the user friendly identification and silviculture manual (466 pp.) to tree species from the Peruvian Andes with economic and reforestation potential. Dr Carlos Reynel (project leader in Peru) and Dr Terry Pennington (UK project staff) led this work. It contains descriptions, illustrations and silvicultural information for 130 species. This is 30 species more than our original estimate, with extra species included at the request of several organisations active in agroforestry in the Peruvian Andes such as Pronaturaleza, PRODAPP and Centro Mallqui. All 130 species are illustrated, with virtually all the line drawings prepared by Carlos Reynel at no extra cost to the project, representing considerable value for money (these would have cost c.£13,000 to be produced by freelance artists in the UK). The book also contains a colour photographic insert depicting c. 50 of the species using digital photographs taken by project staff.

Much of the silvicultural information included in the guide was gleaned from bibliographic research in the library of RBG Kew. In some instances, this information had been produced in other neotropical countries, and the sources were not available in Peru. All this literature relevant to Peruvian forestry is now repatriated to MOL.

The format for the guide followed that successfully used by the prior project, which has received favourable feedback from users in Peru.

b) CD of specimen images (Catalogo digital de fotos de especimenes de árboles del Perú)

In the prior project, digital images were taken of 2000 specimens from the MOL collection, most of which were unique to MOL, because duplicate specimens have never been distributed. These images were burnt on to 50 CDs, which were distributed free of

charge to other herbaria within Peru. In this project, a second digital camera was purchased, which enabled better close-up photographs to be taken. A second edition of the specimen image CD including close-up photographs is soon to be distributed in Peru, which both disseminates valuable information, as well as ensuring the long-term safety of specimen information, should any disaster (e.g., a fire) strike the MOL collection.

c) On-line herbarium specimen database

The specimen database generated by this project and the prior project using the BG-BASE system is now searchable on-line: <http://rbg-web2.rbge.org.uk/peru/englishquery.html>). The on-line database is of the c. 16,000 MOL specimens databased by this and the prior project. Most of these are not present in herbaria outside of Peru. Most of the records have full geographic, habitat and phenological information.

d) Other scientific papers

Cedrela. Project fieldwork led to the collection of three new species of the mahogany relative *Cedrela*. *Cedrela* is a genus of tropical American mahoganies distributed from Mexico to Argentina, producing valuable timber. The hardwood timber (Spanish Cedar) of *C. odorata* is second only to that of true mahogany (*Swietenia*) in international trade, and is widely used throughout Latin America. The genus contains 17 species and Peru has ten species, more than any other country. Fieldwork conducted during this Darwin project enabled us to collect samples from a wide range of localities and habitats throughout montane Peru and resulted in the discovery of three new species (two dry forest species and one wet montane forest). These will be described in a manuscript to be submitted to Kew Bulletin by Terry Pennington that describes the morphological variation, distribution and ecology of all species, with a discussion of their evolutionary relationships based on DNA sequence data. The new wet montane species is potentially a useful new timber for reforestation between 1500 and 2500 m altitude from Amazonas to Pasco. It is already commonly protected and grown on a local scale for its timber.

Poissonia. Project fieldwork in the Apurimac valley of the southern Peruvian Andes resulted in the collection of a species of the legume *Poissonia* that was clearly different from the single species of this genus, *P. orbicularis* that is reported for this area. Consultation with the taxonomic specialist for this group, Professor Matt Lavin (Montana State University, USA) revealed that the second species is likely to be *P. eriantha*, previously known only from a single collection, and currently recognised as a synonym of *P. orbicularis*. Matt Lavin and Toby Pennington are currently carrying out DNA sequencing studies to confirm the distinctness of *P. eriantha* from *P. orbicularis* and the morphologically similar *P. hypoleuca*, before writing a paper to re-instate this species.

Training and capacity building

1. Training in plant collection and identification in the field

a) Peruvian scientists and technicians

This training totalled 20 weeks and was lead by Terry Pennington and Carlos Reynel, with subsidiary trips lead by Toby Pennington. The MOL technician (Aniceto Daza)

received training throughout and MOL assistant professor José-Luis Marcelo received eight weeks training. APRODES technicians and scientists received 10 weeks training. The trainees were selected because they have permanent or long-term contracts with their organisations, and will therefore be able to pass on plant collection and identification skills beyond the end of the Darwin project.

Training formed part of the field research in the Andes (see above). This ensured that all training delivered useful data for the project, thereby maximising outputs relative to input of staff time. It also ensured that the trainees saw the benefits of their new skills directly. Training was by “job shadowing”, followed by independent work assessed by the trainer. For example, in the field, the trainees were shown how to collect and press high quality specimens from trees, and which data relating to the trees must be recorded. The trainees were then expected to carry out these tasks unassisted, but observed by the trainer.

The trainees were taught:

1. How to climb trees safely and use long-arm pruners to collect specimens.
2. How to press specimens in the field for subsequent drying.
3. Which data must be recorded for an individual collection, which are necessary for an adequate herbarium specimen label.
4. How to preserve plant specimens in the field by overnight drying using a gas stove.
5. Techniques of field identification, especially key field characters for the priority species.
6. How to use the identification manual.

Assessment was by Terry Pennington, Carlos Reynel and Toby Pennington, who ensured that each trainee had reached competence in each of the tasks.

b) Peruvian undergraduate students

Toby Pennington taught a full day course (February 2006) at the Universidad Agraria field station of La Genova to 10 undergraduate students. This covered the biodiversity and identification of the plant family Leguminosae, which is the dominant tree family of neotropical forests. The course involved half a day of lectures and laboratory work and half a day studying plants in the field.

Carlos Reynel is supervising many thesis students at the Universidad Nacional Agraria. Three of these are carrying out taxonomic studies of plant groups in the Andean Chanchamayo region of Central Peru, which are directly relevant to the project. These students are: Lucia Iburguren (Euphorbiaceae), Natalia Reategui (bamboos) and Claudia Asmat (Myrtaceae). Additionally, Toby Pennington has provided supervision to Sonia Palacios, whose thesis covers savanna vegetation in the Chanchamayo region, and Jedi Rosero, whose thesis investigates growth patterns of seasonally dry tropical forest trees. Sonia accompanied Toby Pennington, Aniceto Daza and José-Luis Marcelo on a field visit to the Chanchamayo region in February 2006.

2. Training in herbarium curation

a) General herbarium curation

Training in this area took place throughout the project. It largely comprised individual training of technicians and students who were employed to carry out curation work. Twelve students were employed through the two years of the project, with the goal to provide hands-on experience for as many trainees as possible. Peruvian technician trainees were selected because they have permanent contracts at MOL. Undergraduate student trainees were those who showed the greatest interest in plant biodiversity studies, for example those carrying out their thesis research under the supervision of Carlos Reynel. Training was provided by Carlos Reynel, Aniceto Daza, José-Luis Marcelo and Pamela Caceres, an experienced student trainee from the prior project.

Two classes in plant systematics were taught to undergraduate students at MOL in October 2004 by Toby Pennington. The first covered herbarium curation using taxonomic monographs, which included updating the identification of specimens at MOL using recently published monographs purchased via the project. The second covered taxonomic tools available on the world wide web, with particular emphasis on information relevant to Peruvian botany.

b) Database training

In October 2004, a three day course in botanical databasing using the Windows version of BG-BASE was held at MOL with five trainees (three MOL technicians and two students). This was lead by Kerry Walter, the author of the database, assisted by Sabina Knees (RBGE; funded by non-Darwin RBGE funds), who has extensive experience using the database both in the UK and overseas. Translation was provided by Toby Pennington and Dante Anton (one of the students employed by the prior project).

c) Achievements in herbarium curation in Peru

19200 specimens were mounted and incorporated into the MOL collection, which is 4200 more than our target. In addition to the 8600 specimens mounted and incorporated by the prior project, the MOL collection has been expanded by c. 28000 specimens, more than doubling its size.

7200 specimens were databased (1200 more than our target) in addition to the c. 9000 MOL specimens databased in the prior project. In the prior project, Tania Durt databased c. 3000 RBG Kew and RBGE specimens, and *BG-BASE* staff at RBGE were also able to convert an additional 15,000 thousand specimen records generously donated from a Missouri Botanical Garden (MO) database. MOL is therefore left with a substantial database comprising c. 35,000 specimen records, most of which have full geographic, habitat and phenological information. The c. 16,000 MOL specimens are searchable on-line at <http://rbg-web2.rbge.org.uk/peru/englishquery.html>. The importance of this database for collection management at MOL is considerable; for example, it enables the printing of standardised labels for MOL specimens, the majority of which had only hand-written labels.

An additional output is capturing digital images of key plant specimens. This is an excellent means of safeguarding at least some of the MOL specimen information indefinitely. In the prior project, digital images were taken of 2000 specimens from the MOL collection, most of which were unique to MOL, because duplicate specimens have never been distributed. In this project, a second digital camera was purchased, which

enabled better close-up photographs of these specimens to be taken. In addition, Pamela Caceres has taken over 500 images of specimens of Moraceae, and Aniceto Daza has captured images of 1000 collections made by Terry Pennington as part of this and the prior project.

MOL holds many duplicate specimens of individual plant collections. In some cases these collections are held only at MOL because no resources have been available to distribute them to herbaria elsewhere. Distribution of these duplicates to international herbaria outside Peru (e.g. RBGE, RBG Kew) will ensure their long-term safety and availability to the scientific community. In Peru, project staff gained the necessary permits for the export of these specimens, and 3400 duplicate specimens were sent to Terry Pennington at RBG Kew. He sorted all these specimens one by one, making an initial assessment of the accuracy of their identification (some of which has not been revised for 40 years). Highlights arising from this process were the first records of the legume genera *Dicymbe* and *Dicorynia* for Peru. A set of duplicate specimens has been sent to RBGE. At this moment, these specimens are being mounted and incorporated into the permanent collections at RBGE and RBG Kew.

3. Other biodiversity teaching

Teaching Peruvian undergraduate students plant systematics and biodiversity studies was a project commitment. Toby Pennington's sabbatical period in Peru enabled expansion of outputs in this area. The number of trainees was higher and their backgrounds more diverse (from undergraduate students to professional scientists), and the nature of training was diversified to include mentoring of undergraduate thesis students, some of whom are carrying out research of direct relevance to the project (see above).

Toby Pennington taught a day-long course to the MSc in Forest Management (Gestión de Bosques y Recursos Forestales; four students) in January 2006 covering the plant diversity and biogeography of neotropical seasonally dry tropical forests, with particular emphasis on Peruvian formations. Trainees on this course included staff of the Universidad Agraria La Molina and INRENA. A second course covered neotropical plant biogeography (4 hours of lectures) to a group of c. 35 undergraduate students and 4-6 MSc students.

4. Physical capacity building: provision of teaching herbaria

Two small teaching herbaria were constructed in the Universidad Nacional Agraria's field stations at Satipo and La Genova. The facilities comprise space for herbarium cabinets and teaching small classes. The La Genova facility now houses ca. 300 duplicate specimens transported from MOL, and Carlos Reynel and José-Luis Marcelo used the herbarium in October 2006 for a field dendrology course of 27 students.

The original intention of the project was to provide a single facility in the Genova station, but the provision of free labour for its construction freed funds to construct the second facility at Satipo.

5. Training and other activities in UK

Although no formal training for Peruvians in the UK was included in this phase of the

project, two items merit mention. First, Euridice Honorio, a student trainee in the prior project successfully studied for an MSc in Plant Biodiversity and Taxonomy at the University of Edinburgh and RBGE (September 2005 – September 2006). She gained a distinction for her research project, which examined floristic relationships of the area of Jenaro Herrera in the Peruvian Amazon (one of the study sites of the prior project). Euridice has returned to her post in Peru as curator of the Amazonian herbarium at Jenaro Herrera. Funding for her MSc was gained from the EU Alban programme and the Friends of RBGE, with applications made with Toby Pennington's assistance. Euridice is the fifth student trainee from this and the prior project who has gone on to carry out a biodiversity related MSc in Europe. Sonia Palacios, a thesis student supervised by Carlos Reynel and Toby Pennington is currently planning to make an application to study for a tropical forestry MSc in Europe.

Toby Pennington also used personal airmiles to fly Aniceto Daza, the MOL technician, to the UK for one month (June-July 2006). Aniceto has been perhaps the key MOL trainee in both project phases, now has an excellent knowledge of the Peruvian flora, and is well versed in all aspects of herbarium management. He had never travelled outside Peru, and his visit to the UK enabled him to experience major herbaria and living collections at RBG Kew (hosted by Terry Pennington), RBGE (hosted by Toby Pennington) and the University of Oxford (hosted by Colin Hughes). He was also able to work directly with Terry Pennington and Toby Pennington on final drafts of the identification manual.

5. Project Impacts

Purpose

The project purpose was to build capacity in Peru to survey, conserve and sustainably use Andean forests and their tree species, with particular emphasis in the Central Andean Chanchamayo region. The publication of the identification and silviculture manual of 130 Andean tree species is an important step in capacity building. In being fully illustrated, non-technical, and in its coverage of mostly intermediate altitude species (1500-3500 m), this guide is unique. It will be distributed free of charge to NGOs, Universities, and the Peruvian Government environment departments INRENA and INIA.

One example of use of information in the guide is already provided by the work of our project partner APRODES. They have started producing native species of Podocarpaceae in their high-altitude Chanchamayo nursery using information gathered during the compilation of the silviculture manual. These seedlings are being distributed for planting to the local communities with which APRODES works. Podocarpaceae species have particularly prized timber, and the intention is that these trees will provide a source of income in the medium to long term.

Unexpected impacts were the construction of the second teaching herbarium at Satipo, made possible by provision of extra financial support by the Universidad Nacional Agraria, and the increase in training and field research outputs made possible by Toby Pennington's sabbatical in Peru.

Impacts relating to the CBD

The project has helped Peru meet its obligations under the CBD in several ways (see also Appendix 1):

- (i) By delivering information about valuable native forest tree species, and encouraging their conservation in small scale agroforestry systems that provide economic benefits for poor rural people.
- (ii) By improving capacity within Peru to carry out forest biodiversity surveys. This is the result of the improvements in the herbarium collection at MOL, including repatriated information from the UK, the provision of an online database, and the training of Peruvian scientists, technicians and students. Evidence that forest biodiversity studies can be delivered because of this improved capacity within Peru is provided by all six major forest concessions in the country that were certified in 2006 consulting the MOL collection and staff for tree identifications.

Impacts on people: trainee outcomes

Trainee outcomes are detailed in the table below. Student trainees are only listed where they were employed by the project at MOL and participated in the curation element of the project, or where they received one-on-one training in relation to their research projects. Please note that some of students trained later in the project are still pursuing their studies, and that the employment rate of MOL forestry undergraduates in general is 100% in environmentally related fields (government and NGOs).

*FCF UNALM = Facultad de Ciencias Forestales, Universidad Nacional Agraria, La Molina. **CDC = Centro de Datos de Conservación.

Trainee name	Trainee status	Current employment
Aniceto Daza	MOL technician	MOL technician, full time
Rocio Ravello	MOL technician (databasing)	MOL technician, part time
Jose Saito	FCF UNALM* Research Staff	CDC** – FCF UNALM, GIS and databasing
Enrique Coraz	National Agrarian Library UNALM	UNALM databasing systems
Jose Luis Marcelo	Assist. Prof. UNALM	Assist. Prof. UNALM M.Sc. Thesis, supported by the Project, to be completed 2007
Pamela Caceres	MOL research assistant	MOL research assistant – currently on short term training visit in Brazil

Sonia Palacios	Undergraduate student, UNALM	Thesis, supervised via project, to be completed Feb 2007
Jedi Rosero	Undergraduate student, UNALM	MOL research assistant – currently on short term training visit in Brazil
Darwin Orós	Undergraduate student Universidad Privada Ricardo Palma, Lima	Thesis, supervised via project, to be completed 2007
Alfonso Reátegui	Graduated student, UNALM	Currently working part time at APRODES
Grimaldo Barrios	Undergraduate student, UNALM	Thesis, partly supervised via project, to be completed 2007
Dante Antón	Graduated M.Sc. student, UNALM	Currently in the Netherlands fundraising to reforest in the Chanchamayo valley
Christian Roehner	Undergraduate student, UNALM	Thesis, partly supervised by the project, to be completed 2007, currently working at Concesiones Forestales Bozovich, Madre de Dios, Peru
Manuel Silva	Graduated student, UNALM	Thesis, partly supervised via project, completed 2005, currently visiting scientist at MOL
Helga Banon	Graduated student, UNALM	Thesis, partly supervised by project, completed 2005, currently MSc student in Spain
Belbi Caceres	Graduated student, UNALM	INRENA employee, currently MSc student in Costa Rica
Jessica Urbina	Graduated student, UNALM	Municipalidad de Lima Metropolitana – Oficina arborización urbanal
Natalia Reategui	Undergraduate student, UNALM	Currently final year student at FCF UNALM, thesis in progress

Lucia Ibareguren	Undergraduate student, UNALM	Currently final year student at FCF UNALM, thesis in progress
Romina Armesto	Undergraduate student, UNALM	Currently final year student at FCF UNALM, thesis in progress
Natalia La Rosa	Undergraduate student, UNALM	Currently final year student at FCF UNALM, thesis in progress
Lucia Eslava	Undergraduate student, UNALM	Currently final year student at FCF UNALM, thesis in progress
Alejandro Reyna	APRODES technician	APRODES nursery technician, full time
Juan Quispe	APRODES technician	APRODES nursery technician, full time
Migdonio Sánchez	APRODES in-field coordinator	APRODES coordinator, full time
Jaime Leon	APRODES scientist	In-field Director, Agroforestry with <i>Inga</i> Project, Chanchamayo

Collaborative impacts

Collaboration has been excellent between the UK and the principal Peruvian partner, MOL. This collaboration has a long history (25 years with RBG Kew and nine years with RBGE), and there is commitment from both sides to develop this partnership in future. For example, MOL is a collaborator with RBG Kew in the recently funded Darwin project *Habitat Restoration and Sustainable use of Southern Peruvian Dry Forest*. Collaboration with APRODES, the second partner in Peru has also been good, and was developed considerably during Toby Pennington's six month period in Peru.

Within Peru, local collaboration has also been fostered, especially via the distribution (free of charge) of the identification manual, and liaison with various NGOs working in Andean agroforestry and reforestation during its development.

It is somewhat early to measure social impact as it will arise by the uptake of the identification and silviculture manual by organisations working with local communities in the Andes. However, given the keen interest and input into the manual by several organisations active in Andean agroforestry, we are hopeful of a positive social impact in the longer term.

6. Project Outputs

All major project outputs were achieved (see Appendix II/III).

Additional outputs were (please see (3) and (4) above for details):

Construction of an additional teaching herbarium in the Chanchamayo region at the Universidad Nacional Agraria's field station in Satipo.

Toby Pennington's six month stay in Peru enabled additional training outputs, both via formal teaching, and student project supervision.

Dissemination

A principal means of dissemination is the project website (www.darwintreediversity.org.pe), which has been substantially re-designed and improved during this project. This has details of the project's published outputs, including downloadable files, plus its other activities.

The identification manual is also a major means of dissemination within Peru, and efforts have been made in Peru and the UK to secure further funds to print more copies for distribution in Peru in late 2007.

Carlos Reynel and José Luis Marcelo made a presentation about the project at the Peruvian National Botanical Congress in 2006, and Carlos Reynel will present a poster at the International Union of Forest Research Organizations (IUFRO) conference, "Forest Research Management in an Era of Globalisation" (Washington DC, USA, April 2007)

7. Project Expenditure

Item	Expenditure £	Budget £	Difference (%)
Staff costs			0%
Rent rates etc. post/tel/stat			0%
Travel			4%
Printing			-1%
Conferences			0%
Capital items			0%
Others			17%
Total			1%

There were no significant changes to the budget during the project. The underspend of 17% under the others heading is due to audit fees being less than budgeted and the agreed transfer from 2005/06 to 2007/08 of £450 to cover the final audit cost.

8. Project Operation and Partnerships

Two partners worked on project activities: MOL and ICRAF. MOL, the main partner, is the Peruvian National Forest Herbarium, and is used as a source of identification of Peruvian forest trees by University researchers, NGOs, INRENA, petrochemical companies and the general public. Furthermore, it is used as an educational tool for forestry undergraduate students, of which the annual intake is 150.

APRODES works with communities of poor farmers in Central Peru, developing mixed small scale agroforestry systems that aim to improve livelihoods and reduce rates of slash and burn agriculture (see www.aprodes.org). APRODES also employs local people in reforestation projects, and educates local communities on the long-term benefits of these projects.

Both MOL (Carlos Reynel) and APRODES (Eduardo Lavalle) were involved in writing the original post-project proposal. Much of it was drafted with Carlos Reynel when he was in the UK in 2004 funded by a Royal Society grant application made by Toby Pennington. Through the project Carlos Reynel, Eduardo Lavalle and Toby Pennington met in Lima to ensure that project implementation was following the project schedule. These meetings helped to ensure that the partnerships followed the original plans. In the original proposal it was clear that MOL would be the main partner in terms of implementation, and that APRODES's role, whilst vital, was lesser in terms of staff time and overall involvement in project activities. MOL (largely Carlos Reynel) managed project finances and staff in Peru, and was intimately involved in the planning and execution of herbarium curation training and fieldwork. APRODES helped plan the logistics of the project fieldwork, and were instrumental in determining the content of the identification manual.

We liaised with the recently funded Darwin project *Habitat Restoration and Sustainable use of Southern Peruvian Dry Forest*, giving advice on various issues of project administration such as handling money in Peru. We also corresponded with the DarwinNet project, and shared our experience of applying for post-project funding. We also consulted with several NGOs regarding tree species that should be included in the identification and silviculture guide. These included Pronaturaleza, PRODAPP and Centro Mallqui. During his time in Peru, Toby Pennington was able to have several meetings with Jonathan Cornelius (head, ICRAF, Peru). These focused largely on the prior project, and issues such as adding data regarding tree species covered in both this and the prior project to the ICRAF AgroForestTree database. Carlos Reynel, Aniceto Daza and José-Luis Marcelo have been involved in fieldwork of the NatureServe project "Andes-Amazonia" that aims to highlight areas of montane forest that merit conservation in the Andes of Bolivia and Peru (see http://www.natureserve.org/aboutUs/latinamerica/andes_amazon.jsp)

Longevity and effectiveness of local partnerships

Local partnerships remain strong and active. For example, MOL (Carlos Reynel and Aniceto Daza) and APRODES are collaborating on a project that aims to bring a forest concession in northern Peru under management by APRODES for conservation. MOL and APRODES are also partners in the new Darwin project *Habitat Restoration and Sustainable use of Southern Peruvian Dry Forest*. MOL, as a centre for information regarding forest tree diversity has strong links and is regularly consulted by many NGOs. Carlos Reynel's unparalleled expertise in Peruvian forest biodiversity means that he is regularly consulted by both government and the private sector. For example, he has liaised with a new INRENA project, "the recuperation of soils of the Chanchamayo region", which is lead by a colleague from the Universidad Agraria, José Rios.

9. Monitoring and Evaluation, Lesson learning

MOL technicians and students employed in the herbarium

A series of milestones were set for monitoring: (i) trainees should be able to use *BG-BASE* and/or to mount and curate specimens independently and to a high standard; (ii) by the end their training period, they should be able to train others in these techniques; (iii) by the end of the project, it the goals for specimen mounting and databasing should be

met. Dr Carlos Reynel and Aniceto Daza monitored these activities continuously, and UK project staff examined them during project visits.

The success of this element of the project is demonstrated by 19200 specimens mounted and incorporated into the collection, and 7200 specimens databased and now available on-line. This leaves a legacy for Peru of a greatly improved herbarium collection of forest trees, which will enable Peruvian biodiversity scientists to survey their forest resources more accurately in future.

MOL and APRODES staff in the field

A series of milestones were set for monitoring: (i) by the end of six months, all participants should be able to collect and correctly process plant specimens independently; (ii) by the end of the project they should be able to identify the majority of the tree species included in the identification and silviculture manual, and teach how to use the manual. Dr Terry Pennington and Carlos Reynel supervised this monitoring.

All trainees demonstrated that they had learned the skills outlined above. Monitoring was by observation during the field trips. The MOL technician (Aniceto Daza) and assistant professor (José Luis Marcelo) have been invited to participate in fieldwork of the NatureServe project “Andes-Amazonia” that aims to highlight areas of montane forest that merit conservation in the Andes of Bolivia and Peru, demonstrating implementation of skills learned via the project.

The success of this element of the project was vital for completion of the principal project output, the publication of the identification and silviculture manual.

Peruvian undergraduate students

Undergraduate students were monitored through formal examinations on taxonomy and biodiversity, and by thesis research. Dr Carlos Reynel supervised this monitoring. For example, students who attended Toby Pennington’s field course in Leguminosae identification have undertaken formal exams in which knowledge and identification skills in this family was assessed.

Undergraduate students who have received thesis supervision from project staff have either passed, or have exams pending (see section 5 above). These thesis students in particular are likely to continue in biodiversity related fields in Peru, which has been the case for thesis students supervised through the prior project (e.g., Euridice Honorio). This demonstrates that that both projects have been successful in building future capacity in Peru for biodiversity studies. In particular, these students will understand the importance of field collection, accurate identification and well-curated biological collections in Peru.

Internal and external evaluation

The project has been monitored by the RBGE internal assessment system, with financial assessment monitored by the RBGE Finance Division. External evaluation has been carried out by the Scottish Executive Environment and Rural Affairs Department (SEERAD). SEERAD are the main sponsor organisation for RBGE, and have monitored the project alongside other RBGE research projects.

Lesson learning

There were two external evaluations of the prior project (which by the direct linkage, evaluated many aspects of the post-project funded work). The first was the Darwin Thematic Review of Taxonomy, and the second, which is perhaps more relevant because it included a half-day consultant visit to MOL in November 2004, was an Evaluation of Closed Projects (ECP) review. The consultant (Anna Karp) was able to interview several staff and trainees of the current project in Lima. The ECP review drew several examples of good practice from the prior project based partly upon interviews with several trainees (e.g., Pamela Caceres, Aniceto Daza) from the current project. It stated that the prior project "...could be showcased as project geared towards the institutional development and capacity building of host-country institutions, led by a very strong partnership with a clear team vision, which included the training of young Peruvian scientists...". Furthermore, it concluded that the prior project provided "...an excellent case study of how the Darwin Initiative's work contributes to the implementation of the Global Taxonomy Initiative objectives 1 to 4."

We feel that the partnerships in this project, and in the prior project, have worked very well, especially with the principal partner, MOL. This reflects several factors. First, the partnership was not new for the prior project as Toby Pennington, Terry Pennington and Carlos Reynel already had a long track record of collaboration. Second, the post-project proposal was developed as a true collaboration when Carlos Reynel was in the UK. This ensured that both partners provided real input and truly co-wrote the proposal. Third, UK staff spent long lengths of time in Peru, helping demonstrate genuine commitment to the local partners. Fourth, much training was done one-on-one. Whilst large training courses may sound impressive on paper, providing high numbers for output measures, it was clear that in our case, maximum legacy could be achieved by identifying key trainees, and investing time in them individually. Finally, communication from the UK to Peru was very frequent, by e-mail, and most critically, by telephone. Calls were made on average weekly. This can be done extremely economically using cheap access numbers.

10. Actions taken in response to annual report reviews (if applicable)

The reviewer of this project has been very thorough and we would like to thank them for their time and input. These reviews have been discussed in detail with the project partners MOL and APRODES, and also where appropriate with ICRAF, the partner from the prior project. Responses to comments on our first annual report are detailed in our second annual report, and only those comments that resulted in changed actions in our work are mentioned here. These are:

Website and linkages

The website was entirely redesigned (see www.darwintreediversity.org.pe). Whilst in Peru, Toby Pennington was able to discuss linkages to and from the ICRAF-Peru website with Jonathan Cornelius (head, ICRAF, Peru), relating to work from the prior project. Via Jonathan Cornelius, we explored the possibility of adding data regarding tree species covered in both this and the prior project to the ICRAF AgroForestTree database, and we are filling data templates provided by ICRAF (Nairobi) for this purpose, though these have yet to be added to their database.

Tree selection for the identification guide

We have included a short section describing the rationale for the selection of the 130 tree species in the introduction of the user-friendly manual as the reviewer suggested.

We were asked to respond to the following points in the recent review of our second annual report:

Partnership with APRODES; achievement of stated project purpose

The reviewer is perhaps correct to suggest that the project output of “APRODES delivering improved agroforestry systems and reforestation” is an overextension of what could be achieved by project activities during the timeframe of the project. However, we contend that this should be the outcome for the activities of both APRODES and other organisations over a longer term. Our goal is for the identification and silviculture manual to promote a diversification of species used in Andean agroforestry and reforestation. Given that several organisations active in these activities (detailed above) requested additional species to be included in the manual, we consider that this will be the case.

One concrete example is that APRODES are already producing native species of Podocarpaceae in their high-altitude Chanchamayo nursery using information gathered during the compilation of the silviculture manual. These seedlings are being distributed for planting to the local communities with which APRODES works.

Expansion of the manual

This expansion was user-driven. Organisations active in Andean agroforestry and reforestation requested additional species to be added. Whilst there was no specific participatory element within this project to determine species inclusion, organizations such as APRODES are working directly with Andean communities, so their requests have not been made without local consultation.

Distribution of the manual (and Amazonian manual)

The majority of the additional copies of the Amazonian manual were sent, after requests, to:

INRENA

Instituto de Investigaciones de la Amazonia Peruana (IIAP)

PRONATURALEZA

Conservation International

Asociación Peruana para la Conservación de la Naturaleza (APECO)

Univ. Nacional de la Amazonia Peruana

Univ. Nacional del Centro

Univ. Nacional San Antonio de Abad, Cuzco - Sede P. Maldonado

Univ. Nacional de la Selva - Tingo María

Univ. Nacional de Trujillo

Univ. Nacional de Ingeniería

Because of continuing demand, ICRAF Peru have recently (February 2007) suggested printing a new edition of the Amazonian manual using cheaper, lighter paper, and

perhaps a smaller page format, to make the book more handy for the field. They would charge a small amount to cover the costs of printing, but we welcome this development.

The new Andes manual will be distributed in the first instance to:

ECOBONA
PRONATURALEZA (Oxapampa, several projects on reforestation)
APRODES
CENTRO MALLQUI
Universidad de Piura (Sierra de Piura)
INRENA
INIA (Instituto Nacional de Investigación Agraria)
Univ. Nacional del Altiplano, Puno
Univ. Nacional San Antonio de Abad, Cuzco
Univ. Nacional Antenor Orrego, Ica
Univ. Nacional del Centro del Peru (Huancayo)
Univ. Nacional de Cajamarca (Jaén)
IIAP
ICRAF

Both manuals are available as pdfs on the project website.

Publicity

One of the reasons for the delay in this Final Report was to be able to give an update on publicity surrounding the project after publication of the identification manual. An article appeared in the Edinburgh Evening News in early February 2007 (see <http://news.scotsman.com/scitech.cfm?id=221102007>). This was the result of a direct contact made to the RBGE Press Office, and a forthcoming press release to mark the end of the project may result in wider publicity. The project and the prior project are also the subject of a short article in the Darwin Newsletter (February 2007). In Peru, the British Embassy has honoured its promise of a book launch, which will take place in March 2007.

11. Darwin Identity

We ensured that all press releases highlighted the Darwin Initiative. The Darwin logo was used on the website, labels that were placed on databased herbarium specimens, and on the major published project output, the identification and silviculture manual. The new teaching herbaria have striking (brass!) plaques on their doors, stating support from the Darwin Initiative.

The understanding of the Darwin identity, and the work of Darwin, is improving in Peru. This has been helped recently by the wide distribution of the major outputs of this and the prior project to Universities, NGOS and Government Departments.

The project was recognised as distinct, and with a clear identity, both within the Universidad Nacional Agraria, La Molina, where the MOL herbarium is based, and APRODES.

12. Leverage

The additional output of a second teaching herbarium at the Satipo field station was made possible by the provision of free labour for the construction of the herbarium at the La Genova station by the Universidad Nacional Agraria, La Molina.

Subsequent to the publication of the identification and silviculture manual, ECOBONA and APRODES have expressed their interest in financing more copies. A decision about reprinting will wait until the outcome of a grant application made by Toby Pennington to the Friends of the Royal Botanic Garden Edinburgh in January 2007.

Terry Pennington was instrumental in the setting up of a plantation trial of *Inga* species based at the La Genova field station in the Chanchamayo valley. The Peruvian partner in this project is the Fundo Desarrollo Agraria, an NGO based in the Universidad Nacional Agraria La Molina, and the Peruvian project leader is Carlos Reynel, with the field director Jaime Leon, the APRODES trainee of this project. The objective is to set up a series of demonstration trials for farmers to show how alleycropping with *Inga* can be used to improve the productivity of poor marginal land. Three species of *Inga* are being trialed initially. The *Inga* trees are planted in rows 4 m apart, coppiced 2 or more times each year and the farmer crops grown in the mulch. The design is based on a very successful demo running for several years in Honduras, set up with EU funding by Mike Hands. The Chanchamayo trial is funded (50K) by a private foundation in London, which wishes to remain anonymous. This foundation approached Mike Hands (University of Cambridge, Department of Geography) wishing to support an *Inga* trial, and Mike contacted Terry Pennington for suggestions for the location of the project. The Genova field station is ideal because the land tenure belongs to the Universidad Nacional Agraria in perpetuity, it is accessible, and in the centre of an intensively farmed region.

13. Sustainability and Legacy

This project, building on the foundation of the prior work, has considerable legacy. The published outputs (book, CDs) have been widely distributed in Peru, and the specimen database is available on-line. The improved herbarium facilities at MOL will also endure for many years. The training given to Peruvian scientists, technicians and students will also have a lasting legacy. Scientists and technicians have permanent contracts, and will continue to use their new skills. Undergraduate forestry students at MOL have a 100% employment record in forestry and related environment and biodiversity fields in Peru. Students trained by the project will bring a much greater appreciation of the role of herbaria and the properly identified plant specimens in vegetation inventory and conservation to a diverse array of biodiversity-related jobs in Peru.

The partners will keep in touch. RBG Kew and MOL have an ongoing Darwin funded project (start date April 2006). Toby Pennington and Carlos Reynel are discussing several possibilities for future RBGE-MOL projects. Terry Pennington, Carlos Reynel and Jaime Leon (APRODES) are closely involved in the new *Inga* plantation project in Chanchamayo. This builds upon this project in that the *Inga* species used are ones included in the identification and silviculture manual.

The improved herbarium is used daily by undergraduate students and visiting academics and other biodiversity specialists.

Additional funding for future work

We will seek funds to print additional copies of the identification and silviculture manual. ECOBONA and APRODES have expressed their interest in financing more copies, and Toby Pennington has made an application to the Friends of the Royal Botanic Garden Edinburgh in early 2007.

Toby Pennington and Carlos Reynel have discussed in detail various possibilities for future work, but any applications will be held until the impacts of the current project can be better quantified. We see various possibilities, including a third identification and silviculture manual to Peruvian dry forest species. Peruvian dry forest areas are either wholly degraded or highly threatened, and in the inter-Andean valleys, there are no protected areas. There is a clear need for information about tree species with agroforestry and reforestation potential. A second possibility focuses on the assessment of various plantation forestry experiments in Peru that were established over the past 20 years, but which have never been evaluated because of lack of funding.

14. Value for money

We consider the project to have been value for money. Peru has been provided with a greatly improved herbarium facility that will enable future biodiversity scientists to better identify tree species. We have trained over 60 Peruvian students, technicians and scientists in plant systematics, identification, herbarium curation and botanical databasing. The main publication output of the project describes and fully illustrates 130 Andean tree species. We also leave the legacy of an on-line database of 16,000 specimen records.

15. Appendix I: Project Contribution to Articles under the Convention on Biological Diversity (CBD)

Please complete the table below to show the extent of project contribution to the different measures for biodiversity conservation defined in the CBD Articles. This will enable us to tie Darwin projects more directly into CBD areas and to see if the underlying objective of the Darwin Initiative has been met. We have focused on CBD Articles that are most relevant to biodiversity conservation initiatives by small projects in developing countries. However, certain Articles have been omitted where they apply across the board. Where there is overlap between measures described by two different Articles, allocate the % to the most appropriate one.

Project Contribution to Articles under the Convention on Biological Diversity		
Article No./Title	Project %	Article Description
6. General Measures for Conservation & Sustainable Use		Develop national strategies that integrate conservation and sustainable use.
7. Identification and Monitoring	20	Identify and monitor components of biological diversity, particularly those requiring urgent conservation; identify processes and activities that have adverse effects; maintain and organise relevant data.
8. In-situ Conservation	10	Establish systems of protected areas with guidelines for selection and management; regulate biological resources, promote protection of habitats; manage areas adjacent to protected areas; restore degraded ecosystems and recovery of threatened species; control risks associated with organisms modified by biotechnology; control spread of alien species; ensure compatibility between sustainable use of resources and their conservation; protect traditional lifestyles and knowledge on biological resources.
9. Ex-situ Conservation	20	Adopt ex-situ measures to conserve and research components of biological diversity, preferably in country of origin; facilitate recovery of threatened species; regulate and manage collection of biological resources.
10. Sustainable Use of Components of Biological Diversity	10	Integrate conservation and sustainable use in national decisions; protect sustainable customary uses; support local populations to implement remedial actions; encourage co-operation between governments and the private sector.
11. Incentive Measures		Establish economically and socially sound incentives to conserve and promote sustainable use of biological diversity.

12. Research and Training	20	Establish programmes for scientific and technical education in identification, conservation and sustainable use of biodiversity components; promote research contributing to the conservation and sustainable use of biological diversity, particularly in developing countries (in accordance with SBSTTA recommendations).
13. Public Education and Awareness	5	Promote understanding of the importance of measures to conserve biological diversity and propagate these measures through the media; cooperate with other states and organisations in developing awareness programmes.
14. Impact Assessment and Minimizing Adverse Impacts		Introduce EIAs of appropriate projects and allow public participation; take into account environmental consequences of policies; exchange information on impacts beyond State boundaries and work to reduce hazards; promote emergency responses to hazards; examine mechanisms for re-dress of international damage.
15. Access to Genetic Resources		Whilst governments control access to their genetic resources they should also facilitate access of environmentally sound uses on mutually agreed terms; scientific research based on a country's genetic resources should ensure sharing in a fair and equitable way of results and benefits.
16. Access to and Transfer of Technology		Countries shall ensure access to technologies relevant to conservation and sustainable use of biodiversity under fair and most favourable terms to the source countries (subject to patents and intellectual property rights) and ensure the private sector facilitates such assess and joint development of technologies.
17. Exchange of Information	15	Countries shall facilitate information exchange and repatriation including technical scientific and socio-economic research, information on training and surveying programmes and local knowledge
19. Bio-safety Protocol		Countries shall take legislative, administrative or policy measures to provide for the effective participation in biotechnological research activities and to ensure all practicable measures to promote and advance priority access on a fair and equitable basis, especially where they provide the genetic resources for such research.
Total %	100%	Check % = total 100

16. Appendix II Outputs

Please quantify and briefly describe all project outputs using the coding and format of the Darwin Initiative Standard Output Measures.

Code	Total to date (reduce box)	Detail (←expand box)
Training Outputs		
4a	50 undergraduates	Teaching in plant systematics/biogeography for Peruvian undergraduates
4b	1 week	1 week of training under output 4a
4c	5 postgraduates	One day course in plant diversity and biogeography of neotropical savannas and dry forests
4d	1 day	One day taught course
5	11 undergraduates	Work experience and training in herbarium curation by employment continuously over two years
6a	11 trainees	1. Workshop (3 days) in use of new version of botanical database (BG-BASE) used by the project for 5 Peruvians (2 technicians, one graduate, 2 undergraduate) 2. 6 Peruvian scientists, technicians and students trained in field techniques/plant identification
6b	21 weeks	21 weeks training under output 6a
Research Outputs		
8	39 weeks	Weeks spent by UK project staff on project work in Peru
10	1	1 book: Arboles útiles del Ande peruano
11a	2	Two taxonomic papers in preparation
12b	2	1. Enhanced BG-BASE database at MOL with 16,000 records 2. Data on Andean tree species to be added to World Agroforestry Centre database
13b	1	Enhanced MOL collection with 19200 additional specimens mounted and incorporated

Dissemination Outputs		
14b	3	1. Ecodialogo conference, Iquitos, Peru, Feb 2006 (Attendance, Carlos Reynel) 2. Peruvian National Botanical Congress, Sep 2006 (Presentation, Carlos Reynel, José-Luis Marcelo) 3. IUFRO conference, Washington DC, USA, April 2007 (Poster, Carlos Reynel)
15a	2	1. Press release to mark start of project in Peru 2. Projected press release to cover book launch in Peru

15c	2	<ol style="list-style-type: none"> 1. Press release to mark start of project in UK 2. Press release to mark end of project in UK
15d	3	<ol style="list-style-type: none"> 1. Press release to mark start of project in Edinburgh 2. Press release to mark end of project in Edinburgh 3. Article in Darwin Initiative Newsletter
Physical Outputs		
21	2	2 Teaching herbaria constructed at Universidad Nacional Agraria La Molina field stations, La Genova and Satipo
23	c. US\$ 3500	<ol style="list-style-type: none"> 1. US\$2500 for reprinting of user-friendly guide to Amazonian trees (World Agroforestry Centre) 2. Free labour for construction of Andean herbaria (Universidad Nacional Agraria), allowing construction of extra facility at Satipo

17. Appendix III: Publications

Provide full details of all publications and material that can be publicly accessed, e.g. title, name of publisher, contact details, cost. Details will be recorded on the Darwin Monitoring Website Publications Database that is currently being compiled.

Mark (*) all publications and other material that you have included with this report

Type * (e.g. journals, manual, CDs)	Detail (title, author, year)	Publishers (name, city)	Available from (e.g. contact address, website)	Cost £
Book	Reynel, C., Pennington, T.D., PENNINGTON, R.T., Marcelo, J. & Daza, A. (2006, in press). Arboles útiles del ande peruano (Useful Trees of the Peruvian Andes). c. 466 pp: illus 130 b+w, 20 colour.	Tarea Gráfica Educativa, Lima, Perú.	www.darwintreediversity.org.pe	Free
Website	Carlos Reynel/Toby Pennington (2006)		www.darwintreediversity.org.pe	
Website	Toby Pennington (2004; updated)		http://www.rbge.org.uk/rbge/web/science/research/tropdivers/perueng.jsp	
Website	Toby Pennington/Reynaldo Linares (2004; updated)		and http://www.rbge.org.uk/rbge/web/science/research/tropdivers/peruspan.jsp	

18. Appendix IV: Darwin Contacts

To assist us with future evaluation work and feedback on your report, please provide contact details below.

Project Title	Tree diversity, agroforestry development and reforestation in the Peruvian Andes
Ref. No.	332
UK Leader Details	
Name	Toby Pennington
Role within Darwin Project	UK Project leader
Address	Royal Botanic Garden Edinburgh, 20a Inverletith Row, Edinburgh, EH3 5LR
Phone	
Fax	
Email	
Other UK Contact (if relevant)	
Name	Terry Pennington
Role within Darwin Project	Leader field research and training in Peru
Address	Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AB
Phone	
Fax	
Email	
Partner 1	
Name	Dr Carlos Reynel
Organisation	Universidad Nacional Agraria, La Molina (Departamento de forestales, herbario MOL)
Role within Darwin Project	Peru project leader
Address	Facultad de Ciencia Forestales, UNALM, Apto. 456, Lima 1, Perú
Fax	
Email	
Partner 2 (if relevant)	
Name	Eduardo Lavalle
Organisation	Asociación Peruana para la Promoción del Desarrollo Sostenible (APRODES)
Role within Darwin Project	Director, APRODES. Co-ordination of APRODES input to project
Address	Calle C, Residencial El Rocío del Golf, Block W. Dpto 102 Surco-Lima
Fax	
Email	

Annex 1 Report of progress and achievements against Logical Framework for Financial Year: 2005/2006

Project summary	Measurable Indicators	Progress and Achievements April 2005-Mar 2006	Actions required/planned for next period
<p>Goal: To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but poor in resources to achieve</p> <ul style="list-style-type: none"> • The conservation of biological diversity, • The sustainable use of its components, and • The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources 			
<p>Purpose To build capacity in Peru to survey, conserve and sustainably use Andean forests and their tree species, with particular emphasis in the Central Andean Chanchamayo region</p>	<p>Previously un-utilised species and new knowledge of silvicultural requirements incorporated into agroforestry systems and reforestation projects in Central Peru. More tree diversity surveys in Andean forests, with identifications using improved herbaria and identification manual</p>		
<p>Outputs</p>			
<p>Partner organisation MOL able to deliver accurate information about the identification and distribution of Peruvian trees</p>	<p>Backlog of fully identified specimens mounted, databased and incorporated into MOL collection; new teaching herbarium in Chanchamayo built; 24 undergraduates taught plant systematics</p>	<p>7500 specimens mounted at MOL 3000 specimens databased at MOL 1500 specimens digitally imaged at MOL Courses in plant systematics and biogeography for Peruvian students 11 MOL students received on-the-job training in herbarium curation MOL assistant professor, technician and student received field training in collection and identification of Andean trees 2 Teaching herbaria in Andean Peru completed</p>	<p>Mount 2500 specimens Database 1000 specimens</p>

Partner organisation APRODES delivers improved agroforestry systems and reforestation	Greater range of tree species used in APRODES agroforestry systems and reforestation projects	APRODES scientists and technicians received field training in collection and identification of Andean trees	
User friendly identification and silviculture guide published and distributed	Manual reviewed by potential user groups; publisher identified and distribution arrangements made. 500 copies distributed	<i>Species list increased in response to user needs Descriptions of 120 species; illustrations of 125 species; bibliographic information repatriated from UK to Peru for 100 species</i>	<i>Publication and distribution of manual</i>
Publications and presentations	<i>2 press releases in UK; 2 in Peru; One conference presentation; 2 papers published in scientific journals; website</i>	<i>Article in National Parks International Bulletin Website updated</i>	<i>Update website Press releases in UK and Peru 2 scientific papers submitted</i>

Note: Please do NOT expand rows to include activities since their completion and outcomes should be reported under the column on progress and achievements at output and purpose levels.